Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 12(4): 1933, 23 July 2016 doi: http://dx.doi.org/10.15560/12.4.1933
ISSN 1809-127X © 2016 Check List and Authors

Cosmopolitan landhopper *Talitroides topitotum* (Crustacea, Amphipoda, Talitridae) in Java, Indonesia

Mikhail E. Daneliya[1, 2*] and **Daisy Wowor**[3]

1 Department of Biosciences, P.O. Box 65, 00014, University of Helsinki, Finland
2 Taxonomicum, Sydäntie 8 E 16, 01400, Vantaa, Finland
3 Research Center for Biology, Indonesian Institute of Sciences (LIPI), Jl. Raya Jakarta-Bogor Km 46, PO Box 25, Cibinong 16911, Indonesia
* Corresponding author. E-mail: mikhail.daneliya@helsinki.fi

Abstract: The native land and freshwater amphipod fauna of Indonesia is little known. Meanwhile, the readily human-dispersed talitrid amphipod *Talitroides topitotum* (Burt, 1934), reported to have displaced native landhoppers in certain parts of the world, is found for the first time in the Indonesian Archipelago. Specimens were collected in a small drainage channel in the Cibodas Botanical Gargens, Java. The material is described in detail and illustrated herein.

Key words: invasive species; Oriental Region; West Java; morphology

The talitrid amphipod (Crustacea, Amphipoda, Talitridae) *Talitroides topitotum* (Burt, 1934) is believed to be unintentionally introduced via sylviculture throughout the world (Griffiths 1999; Biernbaum 1980; Eutrópio and Krohling 2013). The native range of the species is not known, but was probably confined to the Indo-Pacific Region. It was originally described from Sri Lanka (Burt 1934), and the same year also reported from India (under the name *Talitrus decoratus* Carl, 1934, now synonymic with *T. topitotum*) (Bousfield 1982). Subsequently, the species has been recorded on all continents except Antarctica. Like other landhoppers, *T. topitotum* plays a role as decomposer of organic material. This species has been found to displace native landhopper communities in Hawaii (Howart 1985; Friend and Lam 1985).

During a visit to the Cibodas Botanical Gardens (Indonesian Institute of Sciences) in August 2012, a number of specimens of *T. topitotum* were discovered in a shallow drainage channel. Typically found in leaf litter or other terrestrial habitats, it was sampled from a clump of vegetation debris, submerged in the running water. In this study we report *T. topitotum* from Indonesian Archipelago, Java Island for the first time (Figure 1).

Another widely introduced species from the same genus, *T. alluaudi* (Chevreux, 1896), was recorded from West Java, Bogor, by Stephensen (1935) nearly a century ago. To date, several native talitrids are known from wider Indonesian Archipelago. Among them, *Floresorchestia floresiana* (Weber, 1892) from Flores Island, *F. laurenae* Lowry & Springthorpe, 2015, from Timor Island, and *F. thienemanni* (Schellenberg, 1931) from Central Java, Bali and Flores (Lowry and Springthorpe 2015). The taxonomic status of another two talitrid taxa reported by M. Weber (1892) remains unclear. *Orchestia parvispinosa* Weber, 1892, was found from high elevation site of Mount Salak, West Java, which is later also reported by Chilton (1912). *Orchestia montana* Weber, 1892, was described from the mountains of South Celebes. Poor descriptions and limited illustrations do not allow for the correct assignment of these species. Thus, the native landhopper fauna of Indonesian Archipelago is known poorly from fragmentary records.

The Cibodas Botanical Gardens (Kebun Raya Cibodas) are spread on the northeast slopes of Mount Gede in West Java at elevations about 1,300–1,400 m above sea level. Although there are several natural brooks in the garden, specimens of *T. topitotum* were found in a narrow artificial drainage channel. The individuals occupied a clump of vegetation debris, which was submerged under water. Specimens were collected by hand, and later a preserved female was photographed. The ethanol preserved specimens were studied under a light microscope mounted on a domed clock glass with glycerol drop and topped by cover glass. Two females were described in detail and illustrated using a tracing device (camera lucida). The specimens are deposited in Museum Zoologicum Bogoriense (MZB) and the Finnish Museum of Natural History (MZH).

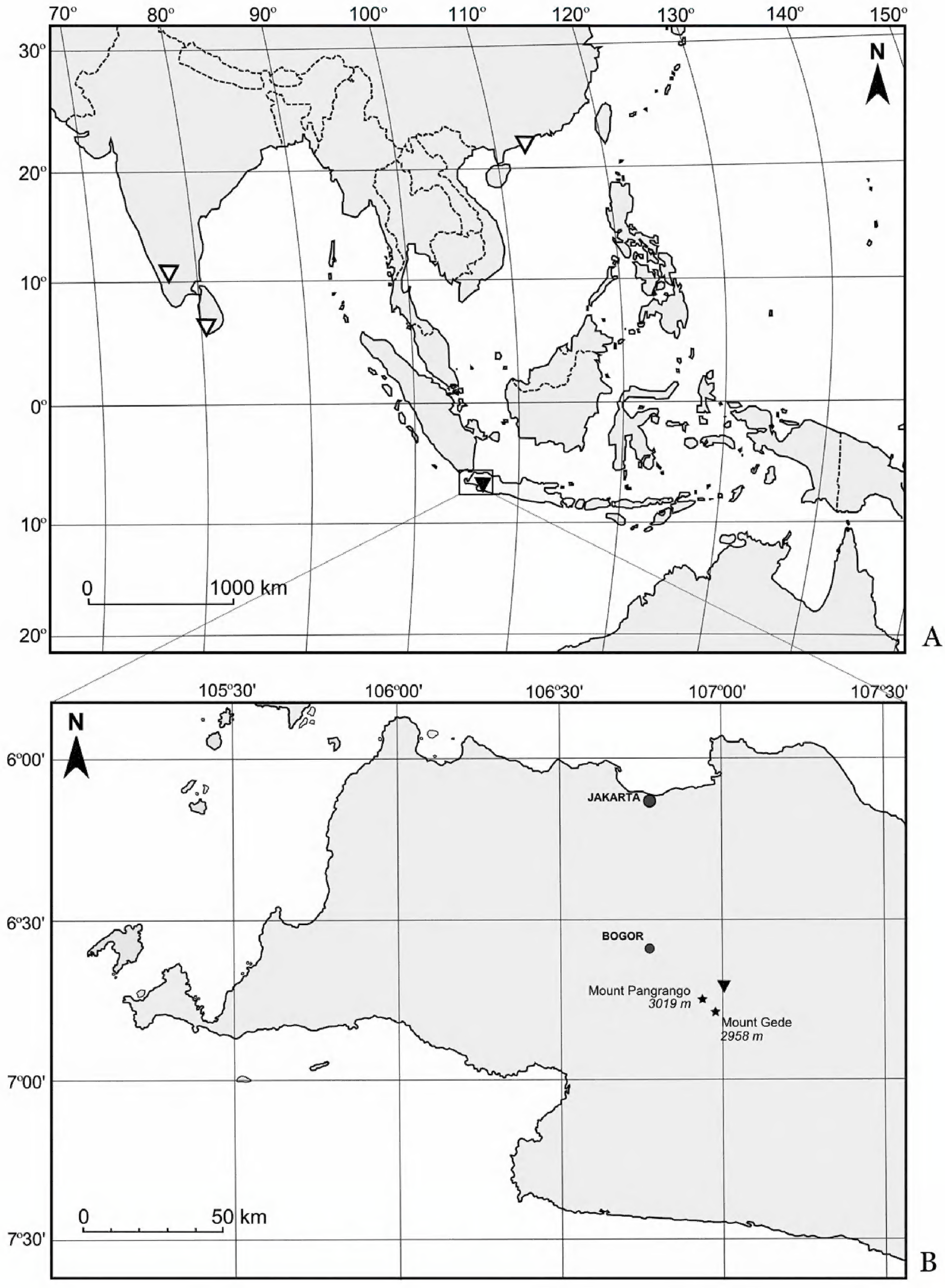

Figure 1. Distribution records of *Talitroides topitotum* (Burt, 1934) in (A) South and South-East Asia (white triangles indicate known records) (B) Western part of Java Island, Indonesia (06°44′ S, 107°00′ E, 1,370 m above sea level).

The synonymy covers only references to works containing descriptions and/or illustrations and taxonomically important compilations.

Talitridae Rafinesque, 1815
Talitroides Bonnier, 1898

Talitroides topitotum (Burt, 1934) (Figures 2–5)

Synonymy: *Talitrus (Talitropsis) topitotum* Burt 1934: 184, fig. 1, plate XII figs. 1–10, plate XIII figs. 1–12; *Talitrus decoratus* Carl 1934: 742, figs. 1–6; *Talitrus sylvaticus*, Shoemaker 1936: 60, figs 1–2; *Talitrus pacificus* Hurley 1955: 155, fig. 3; *Talitroides topitotum,* Vader 1972: 33; Bousfield 1982: 55; Bousfield and Howarth 1976: 150; Friend and Lam 1985: 27, figs. 1–2; Griffith 1999: 350, figs. 1G–L.

Material: 12 females, 5 subadult specimens, Indonesia, Java, Cibodas Botanical Gardens, 06°44′S, 107° 00′E, 1,370 m above sea level, small artificial drainage channel, in debris with leaves, 29 September 2012 (MZB Cru Amp 005); female (dissected; appendages on slide), same data (MZH HLA 150702; slide as HLA 150703); female (dissected; appendages on slide), same data (MZH HLA 150704; slide as HLA 150705).

Body length: 7.5–9.0 mm.

Description of the specimens: Body laterally compressed. Head about as long as deep. Rostrum absent. Eyes dark, round, about half as long as head. Space between eyes shorter than eye diameter. Epimeral plates smooth, not produced posteroventrally; plate 1 posteriorly rounded, plates 2 and 3 angular, with one apical seta. Telson rounded, with three or four lateral spiniform setae on each side, distally truncated, with barely established cleft.

Antenna 1, slightly more than twice as long as head, thinner than antenna 2 and almost as long as peduncle of antenna 2. Peduncle as long as segment 5 of antenna 2 peduncle, with setae directed anteriorly; segment length ratio 1 : 1 : 1.1; segment 1 slightly narrowing distally, with distolateral duplex of setae; segments 2 and 3 nearly cylindrical; segment 2 slightly narrower than segment 1, with distolateral and distomedial duplex of setae; segment 3 slightly narrower than segment 2, with centrolateral and centromedial seta and distolateral and distomedial duplex of setae. Flagellum 8-segmented (7–9-segmented in other specimens; 5–8-segmented in type specimens); segments prolonged, straight posteriorly and slightly convex anterodistally; all segments except terminal with distolateral and distomedial duplex of setae, directed anteriorly; terminal segment small, with three thin apical setae.

Antenna 2 about half as long as body. Peduncle about twice as long as head and as long as antenna 1; segment 3–5 length ratio 1 : 2 : 3; segment 1 with four posterolateral setae; segment 2 very small, barely distinguishable; segment 3 distally with posterior bunch of setae on slight prominence, lateral seta and lateral duplex of setae; segment 4 slightly narrower than segment 3 with five posterolateral pairs of setae, distally with three medial

Figure 2. Habitus of *Talitroides topitotum* (Burt, 1934). Female, Cibodas Botanical Gardens, Java, Indonesia (ethanol fixed specimen). Photo by M.E. Daneliya.

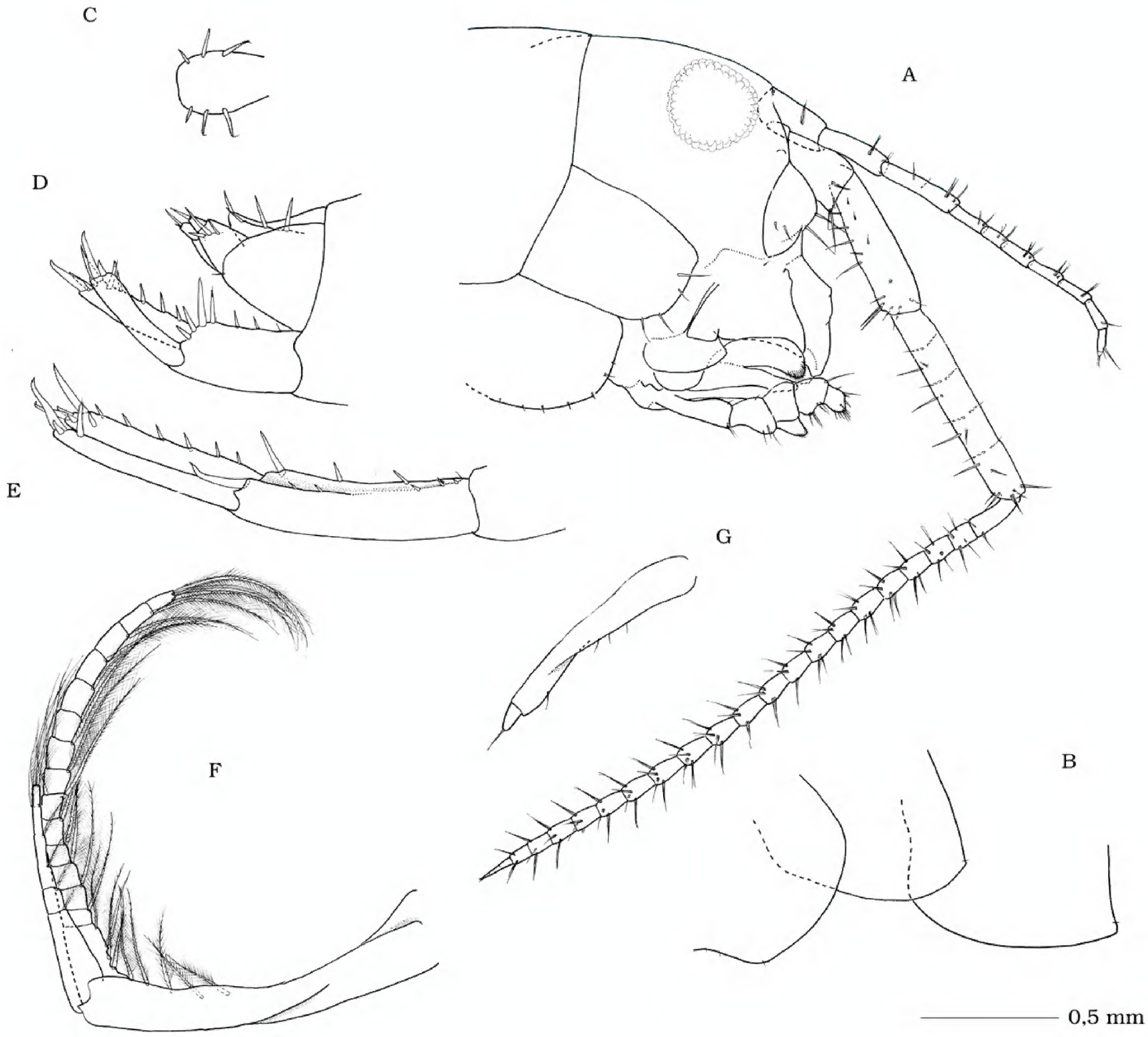

Figure 3. *Talitroides topitotum* (Burt, 1934), female, 7.5 mm, Cibodas Botanical Gardens, Java, Indonesia. **A:** Head with antennae. **B:** Epimeral plates 1–3 (left to right). **C:** Telson, dorsal view. **D:** Telson, uropods 3 and 2, lateral view. **E:** Uropod 1, lateral view. **F:** pleopod 1, lateral view. **G:** Uropod 3, lateral view.

setae and posterior pair of setae; segment 5 slightly narrower than segment 4, with four posterolateral and medial pairs of setae, distally with anterior, lateral and medial duplexes and posterior pair of setae. Flagellum 21-segmented (19–23 in other specimens; 16–22 in type material); segment 1 about twice as long as subsequent segments; each segment, except for terminal, distally with four duplexes of setae: anterior, posterior, lateral and medial; terminal segment spiniform (probably a product of fusion of two or three segments), with apical tuft of short fine setae.

Mouth parts compact, forming mouth cone. Labrum large, distally rounded, with numerous lateral and apical setules. Mandible without palp, with bicarinate tubercle; incisor apically bifurcated, with four (left) or three (right) blunt basal teeth; lacinia mobilis stout, with broad base, four blunt teeth on left mandible, with narrow base and three acute teeth on right mandible; pars centralis with three sickle-form plumose setae; right mandible with additional straight plumose setae in premolar cavity; molars with about 15 transverse laminae and brush of minute setules between them, and long plumose gnathobasic seta. Maxillae 1 symmetrical, inner plate thin, apically with two thick plumose setae, marginally with fine setae; outer plate slightly longer than inner plate, strong, about three times as wide as inner plate, with lateral 2-segmented rudiment of endopod (absent in type specimens); apically with two-three smooth strong sickle-form outer setae and six strong ctenoid sickle-form setae with blunt denticles; inner margin with minute setules. Maxilla 2, plates of about equal length, inner plate slightly broader than outer plate, apically with thick setae; inner plate with thick plumose seta of same type as apical setae of maxilla 1 inner plate. Labium simple, with large outer and small rudimentary inner lobes; outer lobes with

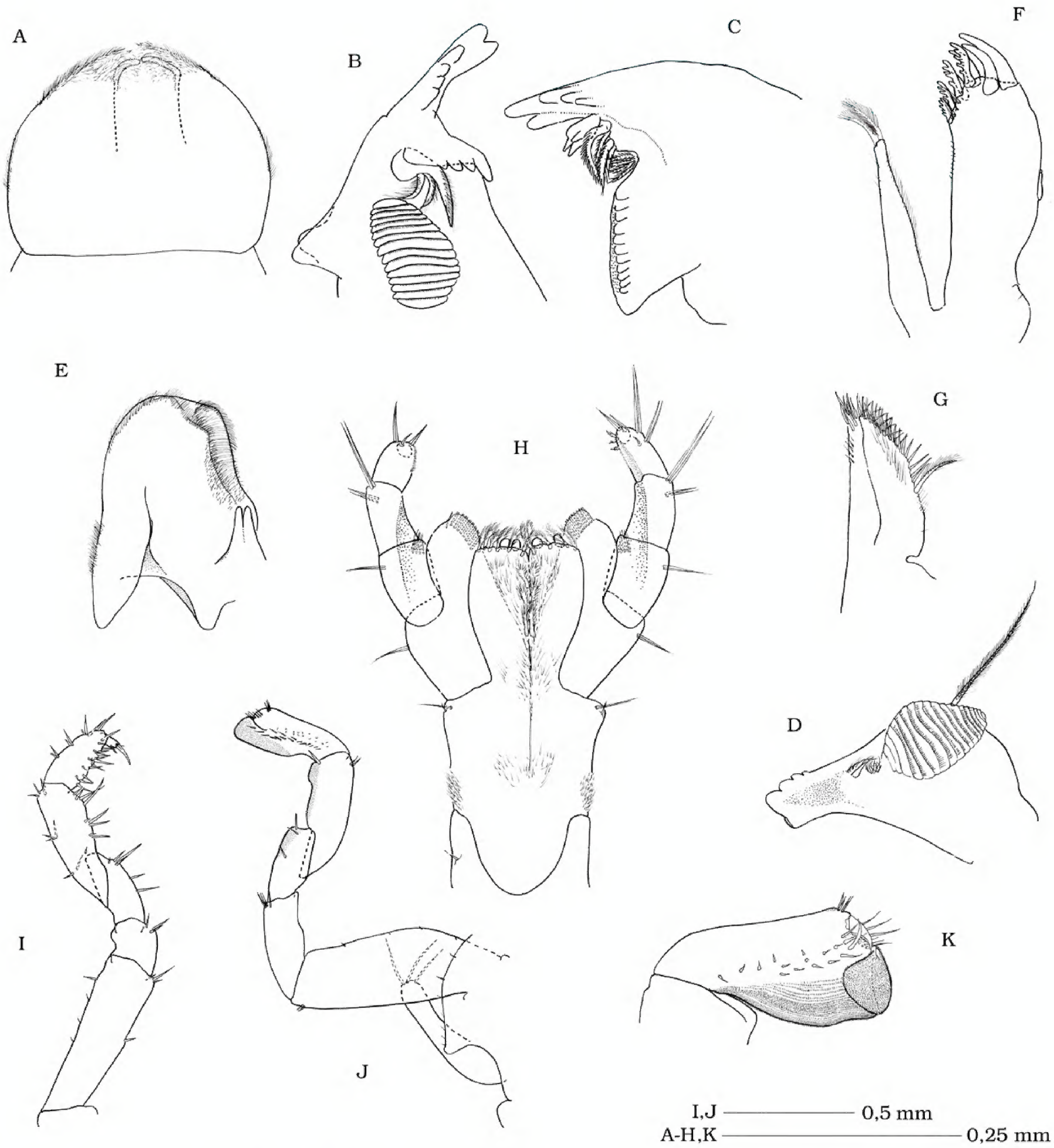

Figure 4. *Talitroides topitotum* (Burt, 1934), female, 7.5 mm. Cibodas Botanical Gardens, Java, Indonesia. **A:** Labrum. **B:** Right mandible. **C:** Left mandible. **D:** Left mandible (with gnathobasic seta present). **E:** Labium (right half not shown). **F:** Maxilla 1. **G:** Maxilla 2. **H:** Maxillipeds, ventral view. **I:** Gnathopod 1. **J:** Gnathopod 2. **K:** Propodus of gnathopod 2 (distal lobe bent).

numerous medial and distal setules; mandibular process with lateral field of setules.

Maxilliped, produced beyond labrum. Coxa with one lateral seta. Segments gradually shortening from basis to dactylus. Basis with proximal lateral and anterior fields of setules; distolaterally with one short and a duplex of long setae. Inner plate medial margin with thin setules and thick plumose setae of the same type as in maxillae; distal margin with plumose setae and two subrectangular teeth. Palp 4-segmented. Ischium long, longer than merus, with distolateral duplex of setae; outer plate stretching beyond merus, apically with wide thin blade, posteriorly flanked with about 10 duplexes of blunt setae. Merus with anterolateral duplex and posterodistal tuft of setae. Carpus with anterodistal and distolateral duplexes of long setae. Propodus distally with short anterior seta, four anterior duplexes of long setae, three short serrated setae and multiple medial setules. Dactylus rudimentary.

Oostegites four pairs, at the base of gnathopod 2, pereopods 3–5. Branchia five pairs, at the base of gnathopod 2 and pereopods 3–6, various, convoluted.

Gnathopod 1. Coxal plate prolonged, 1.3 times as long as wide, with four long distal setae. Segment length ratio: 10 : 3 : 5 : 8 : 4 : 1. Basis thinner than basis of gnathopod 2; anterior margin with three fine short setae and one

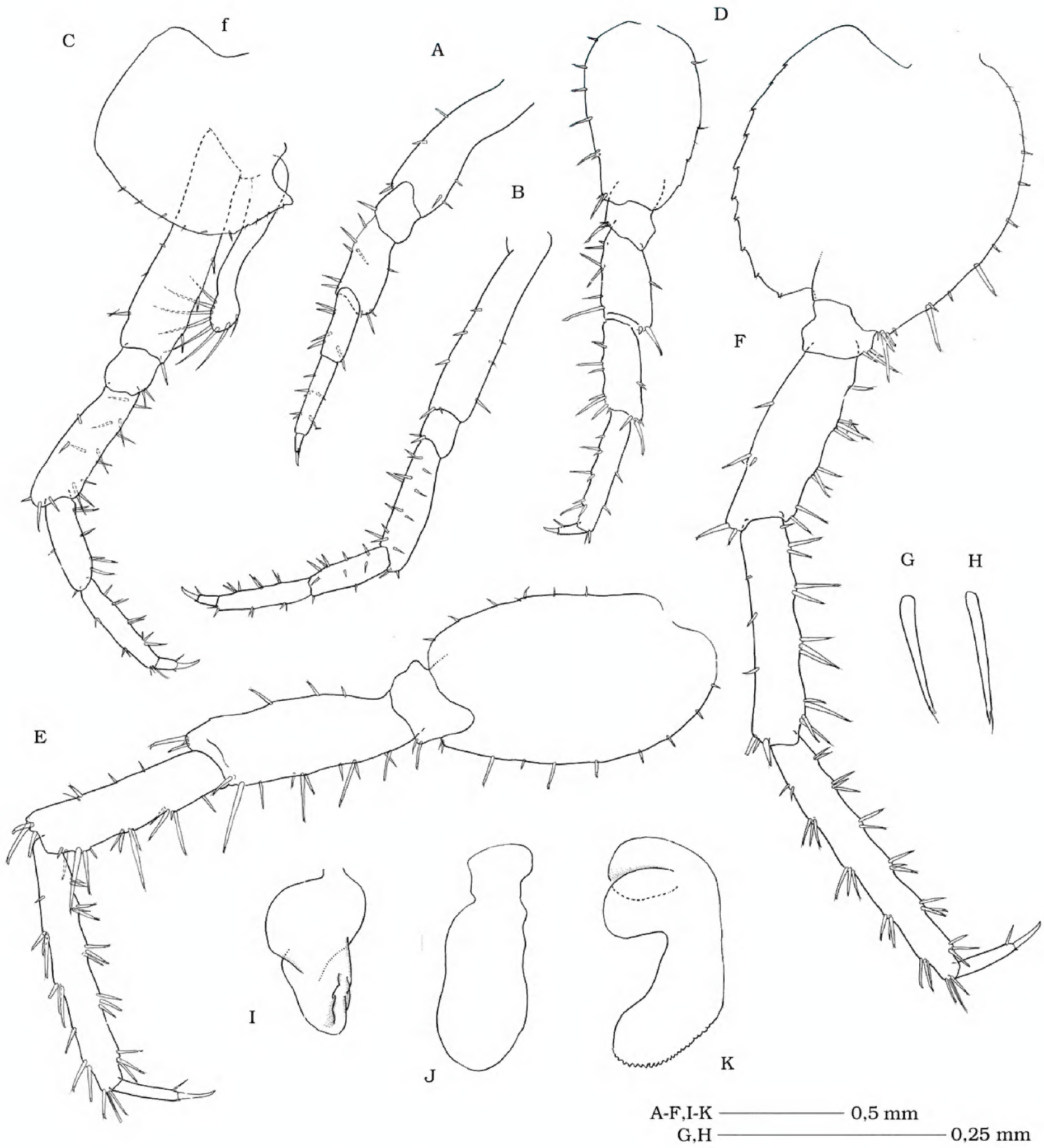

Figure 5. *Talitroides topitotum* (Burt, 1934), female, 7.5 mm. Cibodas Botanical Gardens, Java, Indonesia. **A:** Pereopod 4. **B:** Pereopod 3, medial view. **C:** Pereopod 3, lateral view. **D:** Pereopod 5. **E:** Pereopod 6. **F:** Pereopod 7. **G, H:** Spiniform setae of pereopods. **I:** Coxal gill of pereopod 3. **J:** Coxal gill of pereopod 6. **K:** Coxal gill of gnathopod 2.

spiniform seta distally; posterior margin with one central spiniform seta and distal bunch of one long and two short spiniform setae. Ischium, merus, carpus and propodus with no simple setae. Ischium short, shorter than merus, with posterodistal setal bunch. Merus posterior margin with two central setae and distal bunch of setae. Carpus long, cylindrical; anterior and posterior margins with three bunches each. Propodus almond-shaped, lacking palm; anterior margin with three setal bunches; posterior margin with numerous setae. Dactylus rather short, with posterodistal spiniform seta and two short fine distomedial setae. Dactylar unguis longer than dactylar segment.

Gnathopod 2 with few robus setae. Coxal plate with posteroproximal emargination; posterior margin with four or five short setae; distal margin with five or six short, but stronger setae. Coxal gill distally with short conic tubercles. Brood plate with three long apical setae. Segment length ratio: 2.5 : 1.3 : 1 : 1.8 : 1.5. Basis rather strong, with four very fine short anterior setae

and two short robust posterodistal setae. Ischium long, longer than merus, with posterodistal bunch of short setae. Merus, carpus and propodus lobate posteriorly (stronger in males), with microtrichs. Merus with three posterolateral setae. Carpus long, cylindrical, with two anterodistal setae and one posterior distolateral spiniform seta. Propodus expanded distally, with numerous short lateral and medial setae; distal margin with short central and anterior setae.

Pereopods normally with spiniform setae only, represented by two types: anterior setae usually uncinated, i.e., distally hooked, and posterior setae proximally broad, distally narrow. Both setal types with a subapical setule. Dactyli with anterodistal cusp (short spiniform seta).

Pereopod 3 slightly longer than pereopod 4. Coxal plate nearly square, emarginated proximoposteriorly; distal margin with four to six short setae; posterior margin with five short and thinner setae. Brood plate distally with eight long setae. Segments nearly cylindrical, with spiniform setae only, except for propodus. Segment length ratio: 10 : 2.5 : 7 : 4.5 : 5. Basis with three anterior and four posterior setae. Ischium with posterodistal bunch of setae. Merus anterior margin with two central setae and distal bunch of three setae on slight lobe; posterior margin with four bunches. Carpus anterior margin with one central and one distal seta; posterior margin with three bunches. Propodus anterior margin with two central bunches and distal bunch of two spiniform setae and a duplex of long simple setae; posterior margin with four bunches. Dactylus rather short and strong, with posterodistal spiniform seta and a very short anterodistal spiniform seta. Dactylar unguis about as long as dactylar segment.

Pereopod 4. Coxal plate with posteroproximal emargination, five short distal setae. Coxal gills twisted. Segment length ratio: 8.6 : 3 : 4 : 3.6 : 5 : 1. Basis slightly bent proximally, with two or three groups of one or two setae. Ischium with one anterodistal seta. Merus with three anterior and two posterior groups of one to three setae. Carpus with three anterior groups of three or four setae and two posterior groups of one or two setae. Propodus with three anterior and posterior groups of one to four setae. Dactylus narrow, with anterodistal and posterodistal seta. Dactylar unguis shorter than dactylar segment.

Pereopod 5. Coxal plate with four distal setae. Basis slightly tapering distally, about 1.5 times as long as wide; anterior margin six bunches of one or two large setae; posterior margin with five smaller setae. Ischium with distal bunch of three setae. Merus posterior margin with two bunches of one to three setae (including distal); anterior margin with three groups of one to three setae. Carpus nearly as long as merus and 2.8 times as long as wide; posterior margin with two bunches of one to four setae; anterior margin with three bunches of two-four setae. Propodus 5.2 times as long as wide and 1.4 times as long as carpus; anterior margin with four bunches of one to three setae; posterior margin with three bunches of one to three setae. Dactylus robust and short, 2.5 times as long as wide and 0.2 times as long as propodus; apically with anterior seta and rather short posterior seta. Dactylar unguis 0.9 times as long as dactylar segment.

Pereopod 6. Coxal plate. Coxal gills large, three-lobate, extending posteriorly to the basis of pereopod 7; posterior lobe with conic tubercles. Basis larger than basis of pereopod 5, about 1.5 times as long as wide, with nearly parallel margins and slight posteroproximal lobe; posterior margin with six or seven short stout anterior setae; anterior margin with eight spiniform setae, distally becoming longer and a bunch of two spiniform setae on a slight lobe. Ischium with one long and one short seta distally. Merus about 2.5 times as long as wide; posterior margin with three separate setae and distal bunch of two or three setae; anterior margin with four groups of two or three setae (including distal). Carpus as long as merus, 3.7 times as long as wide; posterior margin with three bunches of one to four setae; anterior margin with four bunches of one to five setae. Propodus 1.4 times as long as carpus and 7.5 times as long as wide; posterior margin with five or six bunches of one to three setae, distal bunch also with a duplex of simple setae; anterior margin with five or six bunches of one to three setae. Dactylus rather thin, about 5 times as long as wide and 0.25 times as long as propodus; apically with anterior seta and rather short posterior seta. Dactylar unguis thin, shorter than dactylar segment.

Pereopod 7. Coxal plate bilobate; each lobe with small seta in notch of crenulation. Basis larger than bases of pereopods 5 and 6, almost rounded, about as long as wide, with large posterior lobe; anterior margin with three fine proximal setae, three or four short spiniform setae, two groups of one long (sometimes with additional small in a bunch) and one short spiniform setae, and distal bunch of one long and three short strong spiniform setae; posterior margin with 10 short setae in notches of crenulations. Ischium with anterior bunch of three strong spiniform setae. Merus 2.8 times as long as wide, with five anterior and three or four posterior bunches of one to four spiniform setae. Carpus slightly longer and more narrow than merus, about 5 times as long as wide; anterior margin with five bunches of one to four setae; posterior margin with four bunches of one to four setae. Propodus longer and slightly more narrow than carpus, about eight times as long as wide; anterior and posterior margin with six bunches of two or three setae. Dactylus slender, about 5 times as long as wide and 0.2 times as long as propodus, with long anterodistal and minute posterodistral spiniform seta. Dactylar unguis strong, half as long as dactylar segment.

Marsupium with two embryos.

Pleopods 1 and 2 long and slender, biramous; peduncle long and narrow with five or six long plumose setae in distal part. Pleopod 1, exopod 6-segmented, endopod 15-segmented. Pleopod 2, exopod 4-segmented, endopod 15-segmentes. Pleopod 3 short, with monosegmented rudiment of one ramus, bearing apical seta.

Uropod 1 stretching beyond uropod 2, peduncle slightly longer than rami, dorsally with three proximolateral, one proximomedial, three distolateral and two distomedial spiniform setae, distally becoming longer; terminal distolateral spiniform seta distally curved. Uropod 1 rami of about equal length; exopod with three apical spiniform setae, endopod with five to seven medial and four or five apical spiniform setae; apical setae curved. Uropod 2, peduncle with three dorsal and four stronger distal dorsolateral spiniform setae, forming tuft; rami of equal length, outer ramus with three apical spiniform setae, inner ramus with four medial and form apical spiniform setae; both rami with fine medial serration. Uropod 3 short, uniramous, peduncle conical; segment 1 of ramus with two or three distolateral spiniform setae, forming tuft, segment 2 with two apical spiniform setae, one of them long.

Burt (1934) reported the absence of a rudimantary palp in maxilla 1, which is clearly present in our specimens, as well as those reported from California and Louisiana, USA (Shoemaker 1936). Such a palp is also known for another species of the genus, *T. alluaudi*. *Talitroides topitotum* is distinguished from the related and also cosmopolitan *T. alluaudi* by having a longer antenna 2, which is about half as long as the body, while in *T. alluaudi* it is much shorter. The male pleopod 3 in *T. topitotum* is 2-segmented, and rather small, while in *T. alluaudi*, it is 1-segmented. Pleopods 1–2 are also more reduced in *T. alluaudi*: with 1–3-segmented endopods, while up to seven segments are present in *T. topitotum*.

Originally described from the Sri Lankan town of Hatton and also reported from nearby Talawakelle town (Burt 1934), as well as the Coonoor town in Nilgiri Mountains of India (Carl 1934), *T. topitotum* was subsequently recorded in Mauritius (Barnard 1936), Macaronesia (Azores, Madeira, Canary Islands) (Dahl 1967), USA (California and Louisiana, Shoemaker 1936; Biernbaum 1980; Bousfield 1982) and Hawaii (Bousfield and Howarth 1976), Britain (Bousfield 1971), Hong Kong (Friend and Lam 1985; Lam and Ma 1989), Marquesas, Australia (New South Wales and Norfolk Island), Europe (reviews in Vader 1972; Friend and Richardson 1986), New Zealand (Fenwick and Webber 2008); South Africa (Griffiths 1999), Mexico (Alvarez et al. 2000), Brazil (reviewed in Eutrópio and Krohling 2013) and Costa Rica (Alfaro-Montoya and Umaña Castro 2013). In our study, the species is first time reported from Java, Indonesia.

The type specimens of *T. topitotum* were collected in synanthropic terrestrial habitat, under a packing case, at the elevation of about 1,300 m above sea level and some approximately 80 km from the ocean, and more specimens were reported about 10 km further inland at 1,200 m (cf. Burt 1934). The further records and biological studies, including the Javan collection, are also mostly synanthropic, largely confined to higher elevations, though the range is between 120 and 2,400 m. In Hawaii, the species was also found in a cave (Bousfield and Howarth 1976). The Javan sample was found in artificial drainage channel in a clump of vegetation and debris, which is also the first record of the species from aquatic habitat, compared to other purely terrestrial records. For more details on the habitat and biology of the species see Lam and Ma (1989) and Matavelli et al. (2009).

ACKNOWLEDGEMENTS

We thank Risto Väinölä, the Senior Curator at MZH, for deposition of the specimens, and anonymous referee and the journal editor Robert Forsyth for invaluable comments and suggestions.

LITERATURE CITED

Alfaro-Montoya, J. and R. Umaña Castro. 2013. Primer registro, distribución y aspectos histológicos del anfípodo terrestre, *Talitroides topitotum* (Burt, 1934) (Crustacea: Amphipoda: Talitridae), introducido en las zonas montañosas de Heredia, Costa Rica. Research Journal of the Costa Rican Distance Education University 5(2): 209–215. http://investiga.uned.ac.cr/revistas/index.php/cuadernos/article/view/294

Alvarez, F.; I. Winfield and S. Cházaro. 2000. Population study of the landhopper *Talitroides topitotum* (Crustacea: Amphipoda: Talitridae) in Central Mexico. Journal of Natural History 34(8): 1619–1624. doi: 10.1080/00222930050117512

Barnard, K.H. 1936. Terrestrial isopods and amphipods from Mauritius. Annals of the Natal Museum 8(1): 1–17.

Biernbaum, C.K. 1980. Occurrence of the "tramp" terrestrial amphipods *Talitroides alluaudi* (Chevreux) and *T. topitotum* (Burt) (Amphipoda: Talitridae) in South Carolina. Brimleyana 3: 107–111.

Bousfield, E.L. 1971. Amphipoda of the Bismarck Archipelago and adjacent Indo-Pacific islands. Steenstrupia 1(23): 255–293.

Bousfield, E.L. 1982. The amphipod superfamily Talitroidea in the Northeastern Pacific Region. I. Family Talitridae: systematics and distributional ecology. National Museum of Natural Sciences, Ottawa. Publications in Biological Oceanography 11: 1–73.

Bousfield, E.L. and F.G. Howart. 1976. The cavernicolous fauna of Hawaiian lava tubes. 8. Terrestrial Amphipoda (Talitridae), including a new genus and species with notes on its biology. Pacific Insects 17(1): 144–154. http://hbs.bishopmuseum.org/pi/pdf/17(1)-144.pdf

Burt, D.R.R. 1934. On the amphipod genus *Talitrus*, with a description of a new species from Ceylon, *Talitrus* (*Talitropsis*) *topitotum*, sub-gen. et sp. nov. Ceylon Journal of Science 18: 181–191.

Carl, J. 1934. Un amphipode terrestre des nilgris, *Talitrus decoratus* n.sp. Revue Suisse de Zoologie 41(42): 741–748.

Chilton, C. 1912. Note on *Orchestia parvispinosa* Max Weber, a terrestrial amphipod from Java. Notes from the Leyden Museum 34(2): 163–168. http://biodiversitylibrary.org/page/13206783

Dahl, E., 1967. Land amphipods from the Azores and Madeira. Boletim do Museu municipal do Funchal 21: 8–23.

Eutrópio, F.J. and W. Krohling. 2013. First record of Amphipoda *Talitroides topitotum* (Burt, 1934) (Gammaridea, Talitridae) in the state of Espírito Santo, Brazil. Acta Scientiarum, Biological Sciences 35(1): 37–39. doi: 10.4025/actascibiolsci.v35i1.12447

Fenwick, G. and R. Webber. 2008. Identification of New Zealand's terrestrial amphipods. (Crustacea: Amphipoda: Talitridae). Tuhinga 19: 29–56. http://collections.tepapa.govt.nz/publication/3034

Friend, J.A. and P.K.S Lam. 1985. Occurrence of the terrestrial amphipod *Talitroides topitotum* (Burt) on Hong Kong Island. Acta Zootaxonomica Sinica 10: 27–33.

Friend, J.A. and A.M.M Richardson. 1986. Biology of terrestrial amphipods. Annual Review of Entomology 31: 25–48. doi: 10.1146/annurev.en.31.010186.000325

Griffiths, C.L. 1999. The terrestrial amphipods (Crustacea: Amphipoda) of South Africa. Annals of the South African Museum 105: 345–362. http://biodiversitylibrary.org/page/40649081

Howart, F.G. 1985. Impacts of alien land arthropods and molluscs on native plants and animals in Hawaii; pp. 149–179, in: C.P. Stone and J.M. Scott (eds.). Hawaii's terrestrial ecosystems: preservation and management. Honolulu: Cooperative National Park Resources Studies Unit, University of Hawaii.

Hurley, D.E. 1955. Studies on the New Zealand amphipodan fauna. No. 8. Terrestrial amphipods of the genus *Talitrus* Latr. Pacific Science 9(2): 144–157. http://hdl.handle.net/10125/8882

Lam, P.K.S. and H.H.T Ma. 1989. Some observations on the life cycle and population dynamics of *Talitroides topitotum* (Burt) (Amphipoda: Talitridae) in Hong Kong. Journal of Natural History 23(5): 1087–1092. doi: 10.1080/00222938900770981

Lowry, J. K. and A.A. Myers. 2013. A phylogeny and classification of the Senticaudata subord. nov. (Crustacea: Amphipoda). Zootaxa 3610(1): 1–80. doi: 10.11646/zootaxa.3610.1.1

Lowry, J.K. & R.T. Springthorpe. 2015. The tropical talitrid genus *Floresorchestia* (Crustacea, Amphipoda, Talitridae). Zootaxa 3935(1): 1–68. doi: 10.11646/zootaxa.3935.1.1

Matavelli, C.; M. Uehara-Prado, F.P.P. Leite and A.V.L. Freitas. 2009. Some aspects of the population ecology of the exotic amphipod, *Talitroides topitotum*, in an Atlantic Forest Reserve in Brazil. Crustaceana 82(2): 241–251. doi: 10.1163/156854008X363777

Schellenberg, A. 1931. Amphipoden der Sunda-Expeditionen Thienemann und Rensch. Sonder-Abdruck aus dem Archiv für Hydrobiologie. Supplement 8, Tropische Brinnengewässer 1: 493–511.

Shoemaker, C.R. 1936. The occurrence of the terrestrial amphipods, *Talitrus alluaudi* and *Talitrus sylvatucus*, in the United States. Journal of the Washington Academy of Sciences 26(2): 60–64. http://biodiversitylibrary.org/page/39872247

Stephensen, K.H. 1935. Indo-Pacific terrestrial Talitridae. Bernice P. Bishop Museum Occasional Papers 10(23): 3–20. http://hbs.bishopmuseum.org/pubs-online/pdf/op10-23.pdf

Vader, W. 1972. Terrestrial amphipods collected in the greenhouses in the Netherlands. Zoologische Bijdragen 13(5): 32–36. http://www.repository.naturalis.nl/record/317281

Weber, M. 1892. Die Süsswasser-Crustaceen des Indischen Archipels, nebst Bemerkungen über die Süsswasser-Fauna im Allgemeinen. Zoologische Ergebnisse einer Reise nach Niederländisch Ost-Indien 2: 528–571. doi: 10.5962/bhl.title.52289

Author contributions: DW and MD collected the material, MD identified, described and illustrated the specimens, MD and DW wrote the text.

Received: 28 September 2015
Accepted: 20 May 2016
Academic editor: Regiane Saturnino